



# Plug-In Electric Vehicle Infrastructure: Site Segmentation & Selection Criteria



**Noel Crisostomo & Adam Langton**  
*Energy Division- Emerging Procurement Strategies*  
*California Public Utilities Commission*

CPUC Auditorium, June 10, 2015



# Agenda (morning)

Time (am)	Topic and Goal	Person, Organization
9:30	Administrative Items, Introduction, Purpose	Adam Langton, CPUC Noel Crisostomo, CPUC
9:45	AB 118, ZEV Action Plan Updates	Leslie Barood, CEC Jim McKinney, CEC
10:15	Statewide PEV Infrastructure Assessment	Marc Melaina, NREL Josh Eichman, NREL
10:45	ED moderated discussion with panel	CEC/NREL & Stakeholders
11:15	Regional PEV Readiness Plans	Karen Schkolnick, BAAQMD Todd DeYoung, SJVAPCD Marco Anderson, SCAG Susan Freedman, SANDAG
12 pm	ED moderated discussion with panel	Civic & Air Agencies & Stakeholders
12:30 pm	Lunch <b><u>We will restart promptly at 1:30</u></b>	



# Agenda (afternoon)

Time (pm)	Topic and Goal	Person, Organization
2	Framework to Segment PEV Infrastructure	Adam Langton, CPUC Noel Crisostomo, CPUC
2:30	Breakouts: Interactive Brainstorming on Group Topics	Assigned Groups
2:50	Reconvene and Report	Assigned Groups
3:20	Reactions & Feedback	ED & Stakeholders
3:30	Break	
3:40	Applying the Framework to Infrastructure for Disadvantaged Communities	ED & Stakeholders
4:20	Wrap Up	ED



# Safety & Misc.

- In case of an Emergency
  - Staff will call 911
  - To evacuate, proceed out of 1 of 4 exits:
    - **2 in the rear:** Head through courtyard and down steps, ↗ McAllister, ↗ Franklin, ↖ Turk, end at Gough/Turk at Jefferson Square Park.
    - **2 beside dais:** ↖ Golden Gate, ↗ Franklin, ↖ Turk, end at Gough/Turk at Jefferson Square Park.
- Bathrooms & fountain across the Lobby



# Remote Participation

## Meeting information

---

Topic: R.13-11-007 Plug-In Electric Vehicle (PEV) Infrastructure Site Selection

Date: Wednesday, June 10, 2015

Time: 9:30 am, Pacific Daylight Time (San Francisco, GMT-07:00)

Meeting Number: 275 706 023

Meeting Password: !Energy1

---

To start or join the online meeting

---

Go to

<https://van.webex.com/van/j.php?MTID=m47b41a21fa577f50eaa525fa52a554d4>

---

## Teleconference information

---

Call-in passcode: 866-811-6884

Participant passcode: 8742156



# Ground Rules

- When asking questions, please wait to be identified, and state your name and organization (into a microphone for remote participants).
- Remote participants:
  - Remain on mute unless identified.
  - Use the Raise Hand feature.
- Limit questions to clarify content on the current slide.
- Discussions will be held after each respective speaker.
- 30-second stretch breaks after a segment concludes.



# Today's Objectives

1. To discuss how the State's existing PEV research and readiness plans can be leveraged within the Commission's work on PEV infrastructure.
2. Provide Energy Division and parties greater understanding of issues affecting Site Selection.
3. Discuss the importance of infrastructure in disadvantaged communities and how Site Selection Criteria might be used in this segment.



# 5/28/15 ALJ Ruling

Energy Division staff may

- Use information from the workshops to develop proposals on site selection & data guidelines.
- Propose how such information could be incorporated into the 3 Applications regarding PEV infrastructure.

Parties may incorporate issues or discussion into their formal filings within the 3 Applications.





California Energy Commission

Leslie Baroody, Jim McKinney

# **AB 118 & ZEV ACTION PLAN INITIATIVES**



National Renewable Energy Laboratory

Marc Melaina, Joshua Eichman

# **CALIFORNIA STATEWIDE PEV INFRASTRUCTURE ASSESSMENT**



# Discussion

- How should utilities use the Statewide Assessment in their evaluation of PEV infrastructure needs?
- What uncertainties (vehicle adoption and range, technology changes) will the utilities and CPUC need to navigate as they develop plans for PEV infrastructure deployments?



Susan Freedman, SANDAG

Marco Anderson, SCAG

Karen Schkolnick, BAAQMD

Todd DeYoung, SJVAPCD

# **REGIONAL PEV READINESS PLANS**



# Discussion

- How should utilities leverage these Readiness Plans to find customers and select sites and locate infrastructure appropriately?
- What special regional considerations should the State be aware of in terms of planning infrastructure deployments? For example: commuting patterns, land use development densities, and other local factors.



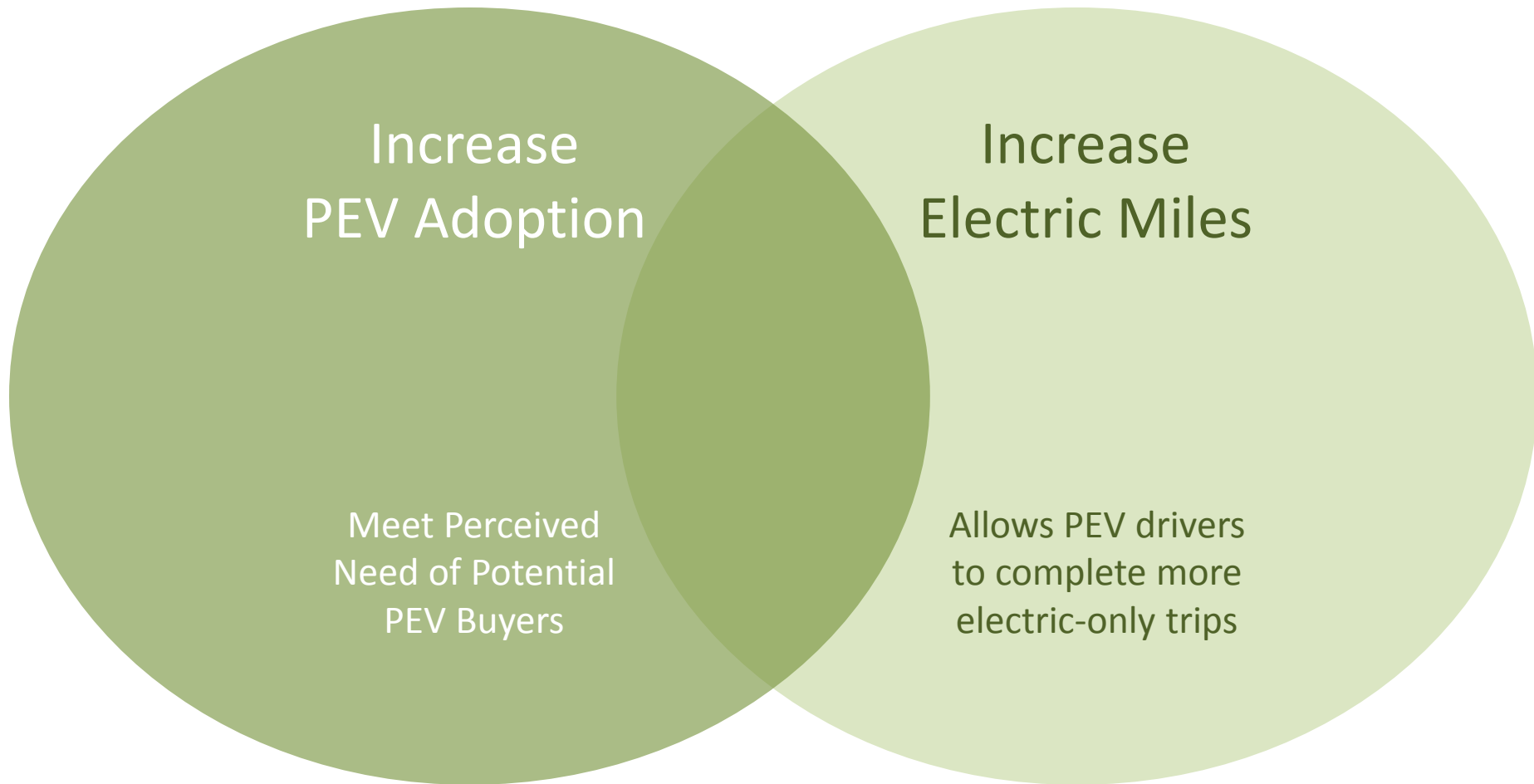
California Public Utilities Commission - Energy Division

Adam Langton

Noel Crisostomo

# **SITE SEGMENTATION & SELECTION CRITERIA**

# Goals from Charging Investments



# Limited \$ < Total Sites

- Ensure that technology expenditures meet the constraints of the facilities and users' needs.
- Prioritize among sites to maximize benefits
- Numerous methodologies to Prioritize
  - First come, first serve
  - Installer judgment
  - Minimum requirement for certain categories
  - Restrictions
  - Weigh/Rank based on criteria



# Limited \$ < Total Sites

- Ensure that technology expenditures meet the constraints of the facilities and users' needs.
- Prioritize among sites to maximize benefits
- Numerous methodologies to Prioritize
  - First come, first serve
  - Installer judgment
  - Minimum requirement for certain categories
  - Restrictions
  - Weigh/Rank based on criteria

*Must define site characteristics*

# Two Aspects of Prioritization

**Site Segmentation** can influence the design of an individual site's charging technology solution.

*“Should Level 1 or Level 2 be installed at workplaces?”*

**Selection Criteria** can drive allocations of funding among individual sites (given their varied value to meeting State goals)

*“What share of investment should be focused on Workplace vs. MUD?”*

*“Would deployments in Silicon Valley or the City have a greater effect on expanding regional eVMT?”*

# Segment Characteristics

A given PEV infrastructure site is defined as a physical property that has parking.

Segmentation is determined by two characteristics:

User characteristics

(driver)

Facility characteristics

(parking lot operator and/or property owner)

# User Characteristics

Type of User	Resident Visitor Employee Fleet
Dwell Time	Long Medium Short
Frequency	Primary Everyday Occasionally Unexpected
Charge Amount	Low (top off) Medium (Return Home) High (full refill)

## User Type Largely Defines Parking Characteristics, though Employees and Visitors have diverse Needs

	Dwell Time	Frequency	Re-charge Need
Resident	Long	Primary	High
Employee	Long/Med/Short	Everyday/Occasionally	Medium
Visitor	Long/Medium/Short	Everyday/Occasionally/ Unexpected	High/Medium/Low
Fleet	Long	Primary	High

# Facility Characteristics

Parking Access	Private
	Public
Control of Space	Not dedicated
	Restricted to PEVs
	Dedicated to a specific driver

# Facility Characteristics

Private – Dedicated

Private – Restricted to PEVs

Private – non-dedicated

Public – Restricted to PEVs

Public – non-dedicated

	Private	Public
Dedicated to a driver		
Restricted to PEVs		
Not dedicated		

A blue-tinted photograph of a parking garage interior. A large sign hanging from the ceiling reads "DRIVE SLOW". Several cars are parked in the background, and the perspective shows the depth of the garage with its structural beams and lighting fixtures.

DRIVE SLOW

# CPUC Parking Garage

Type of User:	Employees and Fleet
Dwell Time:	Long
Frequency:	Everyday
Parking Access:	Private
Control:	Non-dedicated (employees) Dedicated (fleet)



The background image shows the entrance to the Opera Plaza Garage. A large sign above the entrance reads "PUBLIC PARKING ENTRANCE". To the right, a smaller sign says "MONTHLY CARD HOLDERS ONLY". In the foreground, a white sign on a pole points towards the entrance. The scene is dimly lit, suggesting an evening or night setting.

PUBLIC PARKING ENTRANCE

MONTHLY CARD  
HOLDERS ONLY

# Opera Plaza Garage

Type of User: Residential, Employee, Visitor

Dwell Time: Varies

Frequency: Varies

Parking Access: Private and Public

Control: Dedicated and non-dedicated

```
graph TD; UC((User Characteristics)) --> TS([Technology Solution]); FC((Facility Characteristics)) --> TS;
```

**User  
Characteristics**

type of user(s)  
dwell time  
frequency

**Facility  
Characteristics**

Parking access  
Control of parking spaces

**Technology Solution**

Charge Level

Proximity

User Prioritization

Grid Prioritization

# Technology Design

## Authentication

identify eligible user

## Proximity

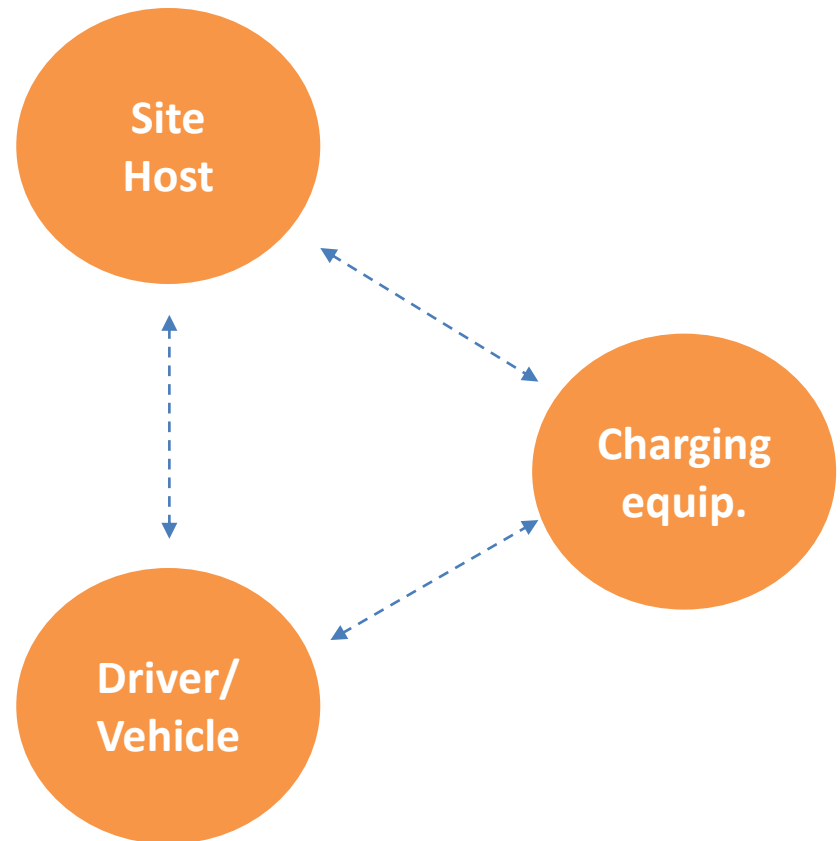
charge cordset must reach vehicle inlet

## User Prioritization

who gets to go first?

## Grid Prioritization

usage should be aligned with grid conditions and facility demand charges



# Segmentation Keys

Residents and Fleets have consistent, predictable charging needs

Employees and Visitors have varying needs depending on their specific circumstances

Dedicated parking spots give the driver the most reliable access to charging

Non-dedicated and 'PEV only' parking introduce complexity for parking lot operators and drivers, but increase efficient use of infrastructure investments

Technology and program design need to respond to the specific user needs and facility characteristics in order to be successful

# Parking managers will invest first in solutions that improve efficiency to reduce costs

2011	2012	2013	Impactful Trends
24	57	59	Technology to improve access control & automate payment
32	64	54	Cashless & electronic payment
27	49	52	Mobile phones to find, reserve, & pay for parking
	49	43	Collaboration btw. Parking, transportation, & planning decisionmakers
44	49	38	Increasing revenue
23	37	31	Improve customer service
36	36	30	Green and sustainable solutions
		28	Parking information systems/dashboards
14	29	25	Wireless sensors for traffic management
23	25	24	Public/Private Partnerships
19	20	20	Accommodate PEVs & charging stations
	21	17	Aesthetics
12		14	Security
		14	Human resources
		11	Alternate facility uses during off-peak hours
		10	Robotic/automated parking

# IPI considers AFVs to be the least important social driver of change to their business

2012	2013	Most Influential Societal Changes
56	62	Traffic Congestion
54	54	Gas prices
46	44	Liveable, walkable communities
50	43	Focus on environment & sustainability
23	34	Aging population
25	29	Bicycle commuters
40	26	Urban migration
17	22	Safety
16	16	Aesthetics
8	13	Alternative Fuel Vehicles



## Two Aspects of Prioritization

**Site Segmentation** can influence the design of an individual site's charging technology solution.

*"Should Level 1 or Level 2 be installed at workplaces?"*

**Selection Criteria** can drive allocations of funding among individual sites (given their varied value to meeting State goals)

*"What share of investment should be focused on Workplace vs. MUD?"*

*"Would deployments in Silicon Valley or the City have a greater effect on expanding regional eVMT?"*



# Selection Criteria

- May help establish a *Loading Order*-like set of guidelines that can assist IOUs and EVSPs in ranking prospective PEV customers and choosing among them.
- Potential Benefits:
  - ***Evaluation*** for potential EVSE usage and project viability
  - ***Leverages research*** like regional plans and adoption models to determine charging network expansion effects
  - ***Transparency*** for sites that are “on the margin” and are chosen (or not) given limited funding
  - ***Ensures additionality*** by preventing duplication of infrastructure provider efforts and limiting free ridership (*if programs are evaluated*)





# Selection Criteria measure installation contributions to Adoption & eVMT Goals

Potential Criterion	Evaluates an Infrastructure Installation's...
<b><i>Visibility</i></b>	Ability to serve as a demonstration to increase the public's acceptance of PEVs.
<b><i>Demand Inducement</i></b>	Ability to meet future PEV needs by leading purchases
<b><i>Demand Support</i></b>	Ability to serve existing PEVs demand to expand electric range and gasoline displacement (esp. Plug-in Hybrids)
<b><i>Regional Expansion</i></b>	Potential to serve as a hub to unlock travel to/from exurbs or enable new adopter segments.
<b><i>Equity</i></b>	Role in availing infrastructure to segments of the population or locations with relatively lower adoption levels.
<b><i>Parking Regulation</i></b>	Ability to enable adoption despite local ordinances or zoning that may limit one's ability to easily install infrastructure.
<b><i>Vehicle-Grid Integration</i></b>	Locational effectiveness as part of an aggregated Distributed Energy Resource to provide beneficial facility, distribution, or system services.
<b><i>Distribution Upgrades</i></b>	Costs associated with providing service to new transportation load.



# Challenges with Selection Criteria

- Applying these criteria is both art and science.
  - A utility's discretion to, for example, *avoid costlier installations* or *pursue more visible installations* may impact competing infrastructure providers.
- Some criteria involve empirically-unavailable or difficult to measure metrics\* that may be less familiar to the utilities.
  - Turnover of Occupants and Employees
  - Frequency of Vehicle Purchases by Income
  - “If [we] build it, [and drivers] come,” but in stages -given varied vehicle purchase timeframes- what assumptions do we make for the resultant ramp-up in utilization?
- How to ensure transparency and fairness while respecting customer privacy (travel, energy use, demography)?



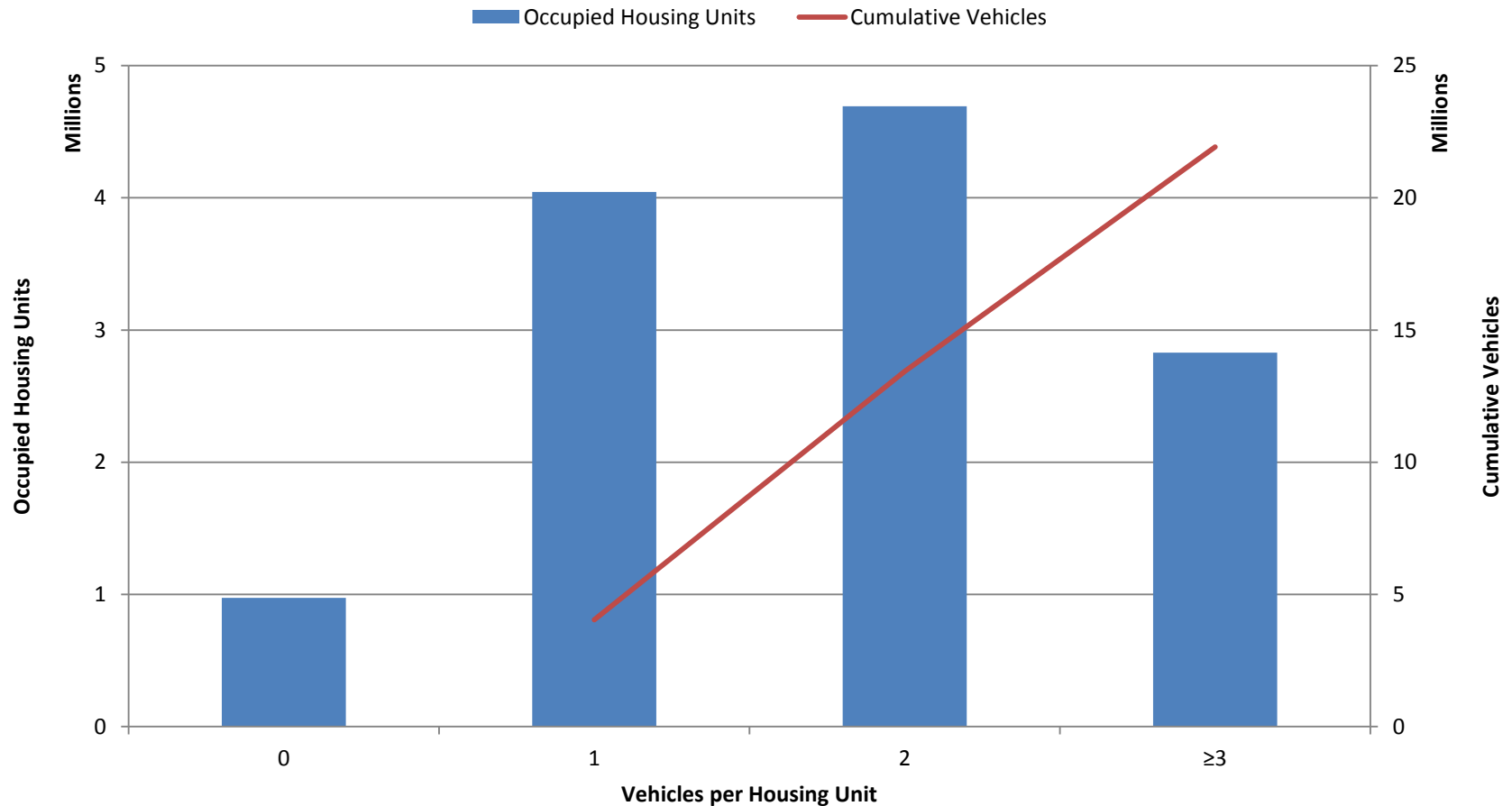
# Regional, Facility, User, & PEV Factors

- Regardless of the use of a Segmentation or the Selection Criteria, infrastructure installations will be affected by site-specific factors that alter prototypical designs and cost assumptions.
- While not exhaustive, the following data provides insight to the types of variation among *residential* Users and Facilities in California.
  - Facility Type, Vintage, and Size
  - Facility Ownership and Occupant Incomes
  - Vehicle Acquisition

**Keep these factors in mind for the subsequent activity.**



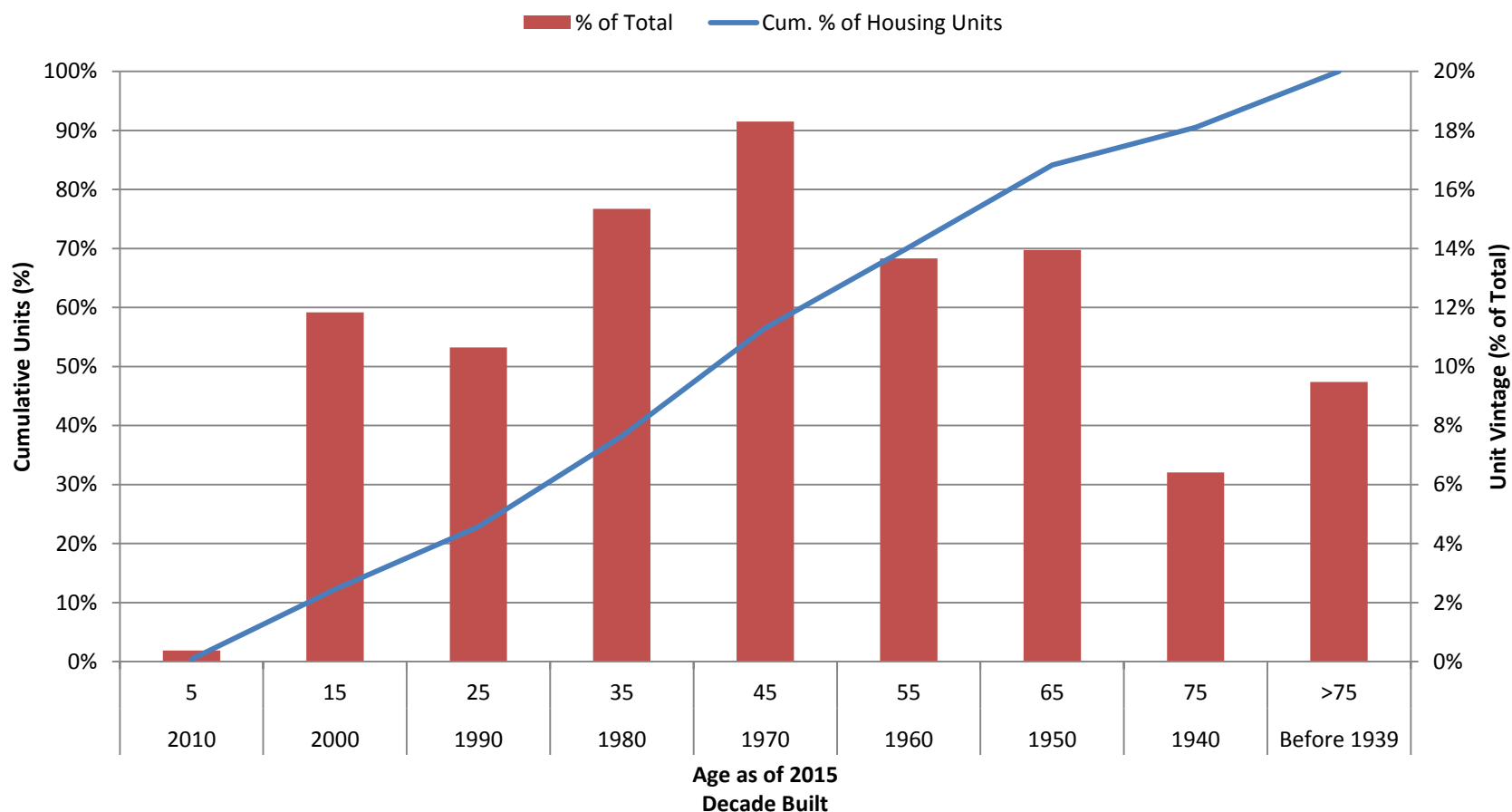
Efforts must expand to the order of  
23 M vehicles<sup>1</sup> & 13 M housing units<sup>2</sup>.



1. CA Department of Motor Vehicles for 2014.
2. U.S. Census Bureau, 2009-2013. 5-Year American Community Survey.



# Half of the housing stock will be 50 years or older by 2020.

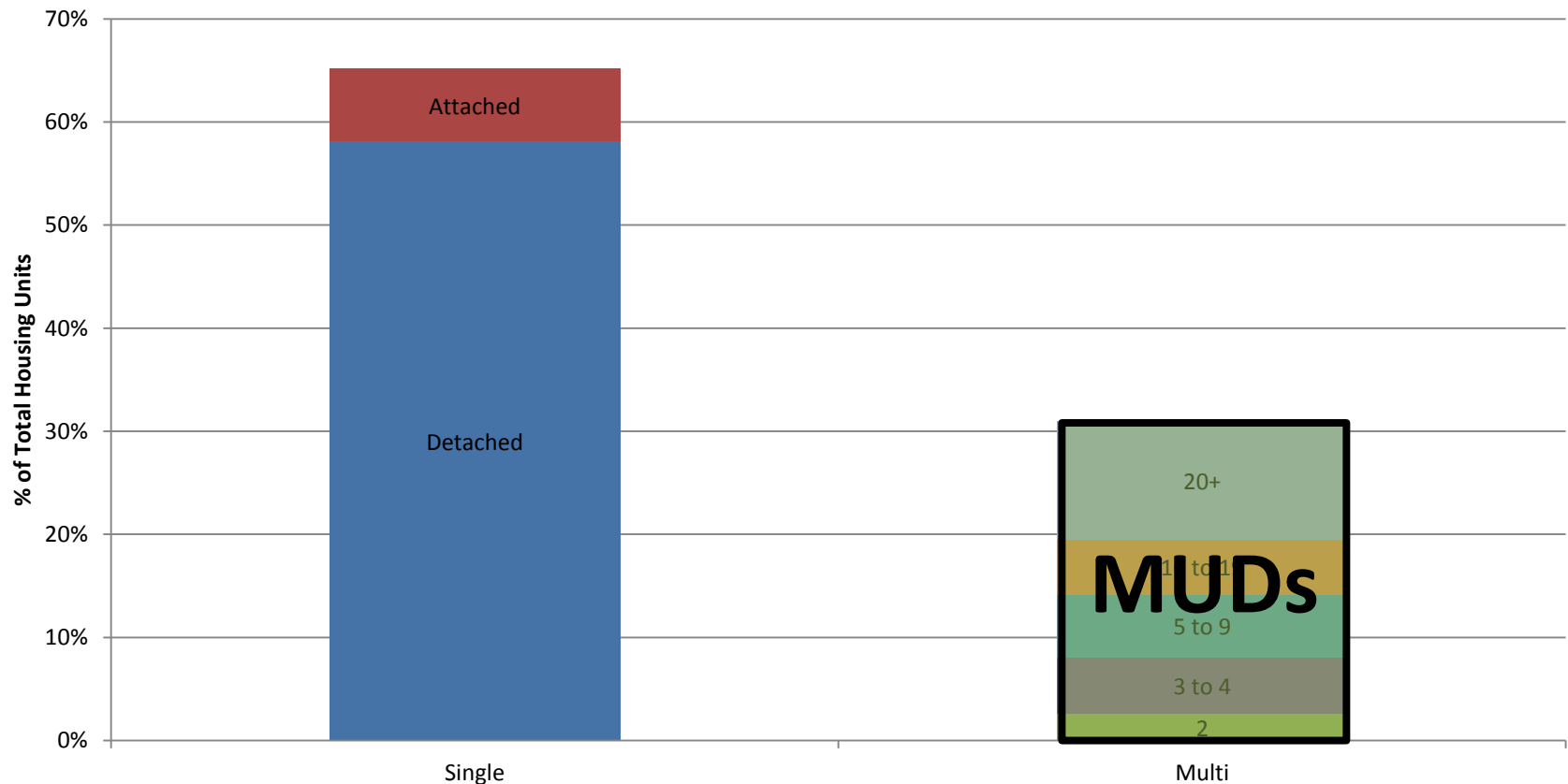


**How does this affect the assumptions for electrical upgrades for infrastructure?**



# Multi-Unit Dwellings are a third of housing and vary widely in size.

## Type and # of Units in Structure

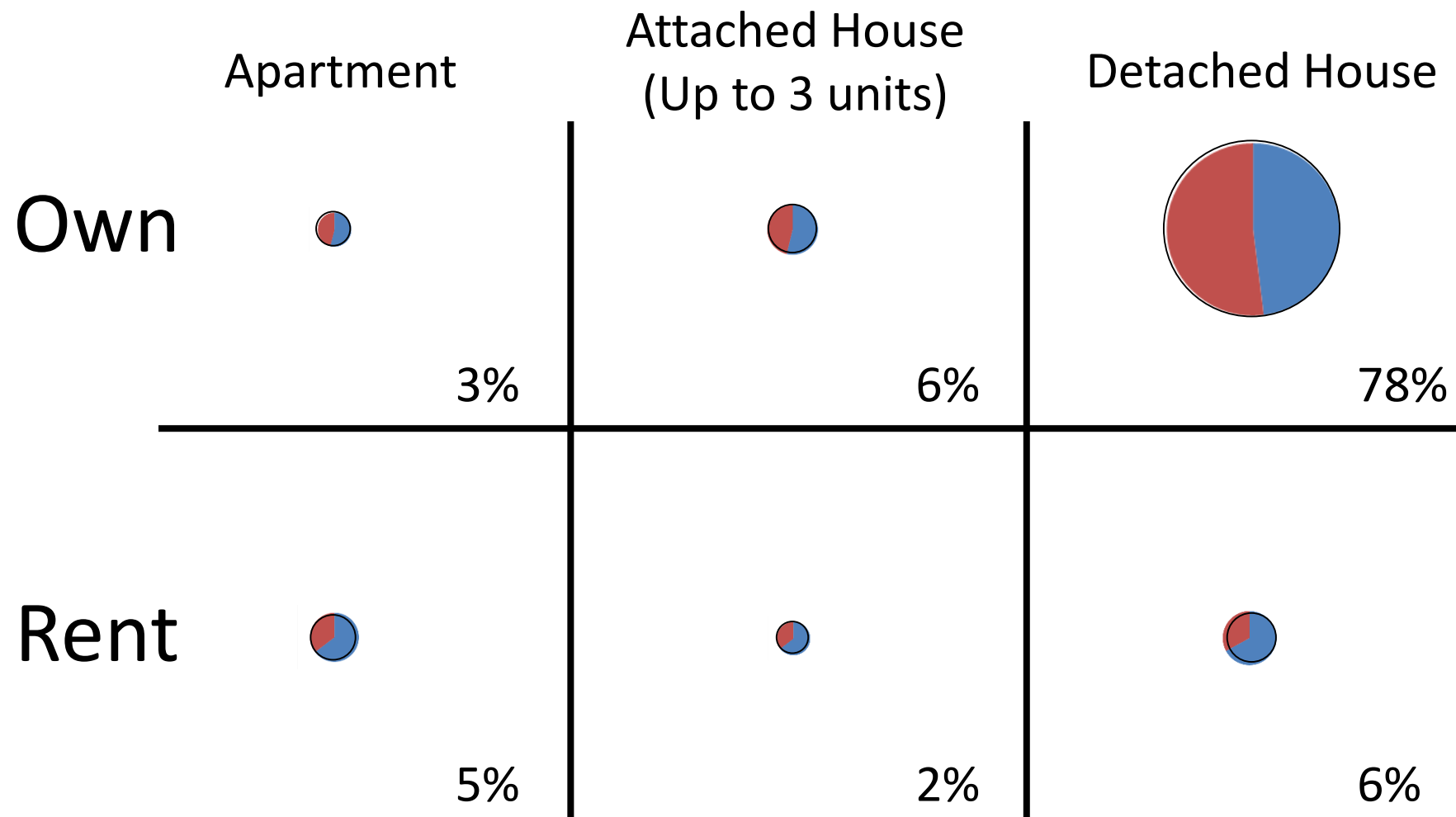


**How does installing an array of 10 EVSE (which may provide greatest scale economies) affect the choice to install in smaller-sized MUDs?**



○: Acquisition (**Purchase** / **Lease**) by segment  
%: Share of CVRP Recipients (scaled area)

Detached homeowners are the only segment more likely to **purchase** than **lease** a PEV.





# Statewide averages obscure regional differences in PEV preference.

	CHEVROLET				Ford				NISSAN		TESLA		TOYOTA				Other					
STATE	BEV		PHEV		BEV		PHEV		BEV	PHEV	BEV	PHEV	BEV		PHEV		BEV		PHEV			
\$000 Income	L	P	L	P	L	P	L	P	L	P	L	P	L	P	L	P	L	P	L	P	Income % Total	Cum.
<25	3	1	12	6	2		4	2	21	3		5	1	1	3	11	16	1			0.7%	0.7%
<50	15	4	48	35	12	4	23	21	109	11		14	6	1	27	54	79	10	1	2	3.7%	4.4%
<75	31	11	114	96	16	7	58	60	174	33	1	33	9	4	49	89	158	24	2	1	7.6%	12.0%
<100	26	12	143	171	29	4	72	81	282	70		60	18	9	43	124	191	32	3	5	10.7%	22.7%
<125	37	21	197	234	38	5	100	110	308	76	2	123	33	11	53	187	203	27	5	6	13.8%	36.6%
<150	22	9	149	157	33	9	74	85	304	56	1	121	28	9	35	113	189	26	2	12	11.2%	47.7%
<175	18	13	128	144	31	14	51	93	241	58	1	126	26	10	35	107	163	22	4	12	10.1%	57.8%
<200	19	7	97	130	23	14	43	68	200	38		113	28	13	21	65	130	17	1	7	8.1%	65.9%
<250	12	8	163	155	28	19	72	95	256	53	7	215	37	18	23	101	162	32	3	8	11.4%	77.3%
<300	10	3	98	82	23	4	36	48	116	24		213	27	12	8	62	90	22	5	4	6.9%	84.2%
<350	8	5	64	53	5	2	21	31	74	15	6	137	15	2	9	32	60	15	2	2	4.3%	88.6%
<400	2	3	23	27	3		15	13	43	10	2	85	8	1	10	17	26	12	1	3	2.4%	91.0%
<450		1	16	21	7		2	14	26	4	2	100	1		2	9	20	5		1	1.8%	92.8%
<500	1		16	6	2		1	4	9	1	2	58		1	2	3	17			2	1.0%	93.7%
>500		2	47	31	4	4	11	14	31	10	16	508	10	8	6	27	47	14	7	6	6.3%	100.0%
Model % Total	2%	1%	10%	11%	2%	1%	5%	6%	17%	4%	0%	15%	2%	1%	3%	8%	12%	2%	0%	1%		





# Selection Criteria should be differentiated by regional markets and customer needs.

Note: Shading is relative to each row (utility or State)

Percent of Total PEV Market by Vehicle Type and Acquisition (Lease, L or Purchase, P)

	Chevrolet				Ford				Nissan		Tesla		Toyota				Other			
	BEV		PHEV		BEV		PHEV		L	P	L	P	L	P	L	P	L	P	L	P
	L	P	L	P	L	P	L	P												
PG&E	2%	1%	7%	10%	2%	1%	4%	6%	21%	5%	0%	16%	2%	1%	2%	7%	11%	2%	0%	1%
SCE	2%	0%	15%	11%	1%	0%	5%	5%	12%	2%	1%	14%	2%	0%	4%	9%	13%	2%	0%	0%
SDG&E	2%	1%	7%	11%	4%	1%	6%	6%	17%	5%	0%	14%	2%	1%	1%	6%	14%	3%	0%	1%
State	2%	1%	10%	11%	2%	1%	5%	6%	17%	4%	0%	15%	2%	1%	3%	8%	12%	2%	0%	1%



**For many models, SCE customers tend to lease their PHEVs more often.**

**PG&E and SDG&E customers have a stronger preference for BEVs than SCE.**

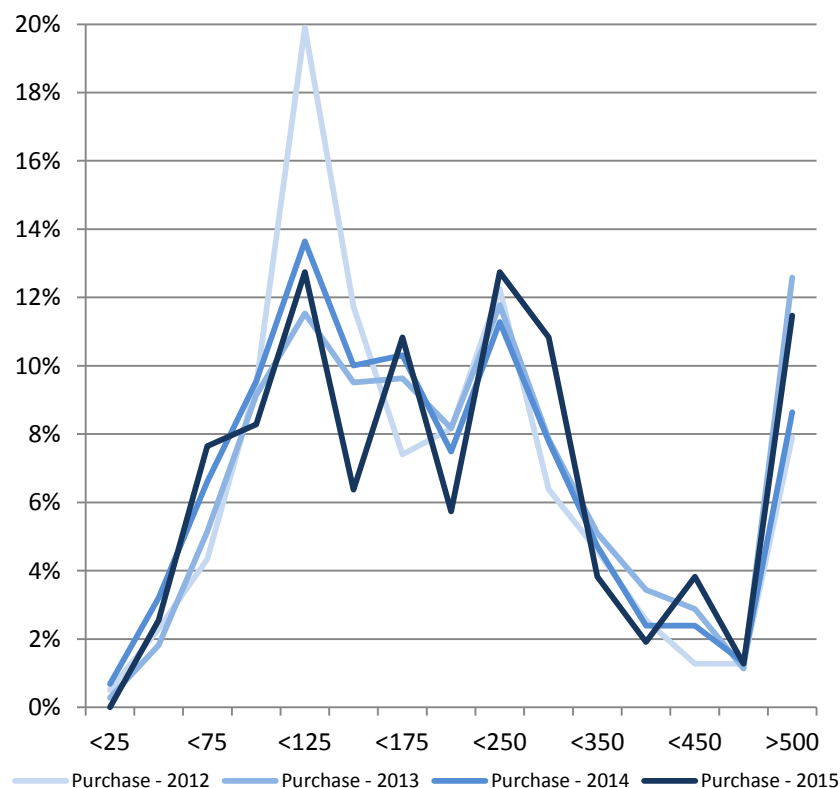


# How have income distributions of PEV acquisitions changed since 2012?

## Leases



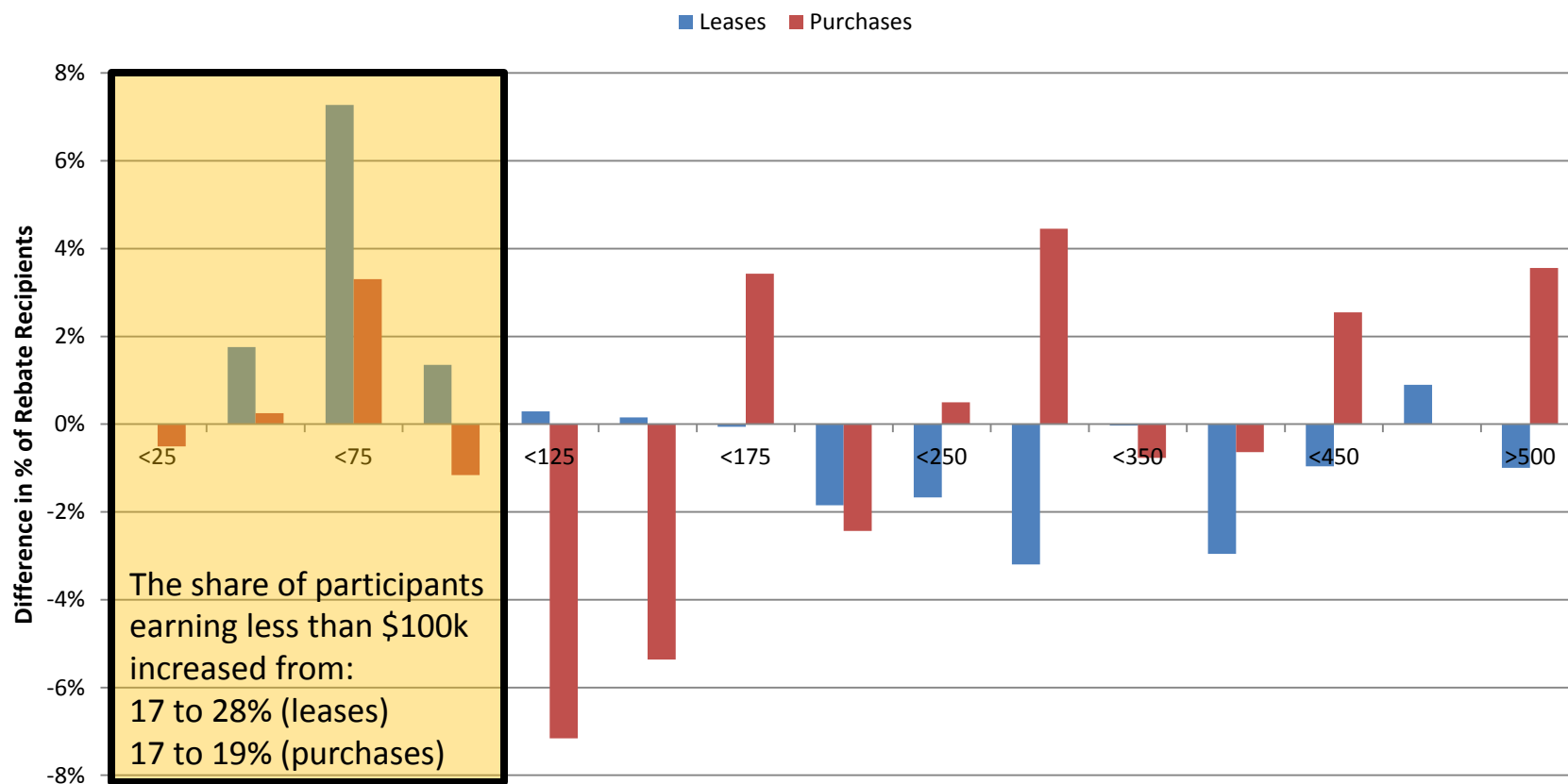
## Purchases





# Low & moderate income adopters grew substantially 2012-5, due in large part to leases.

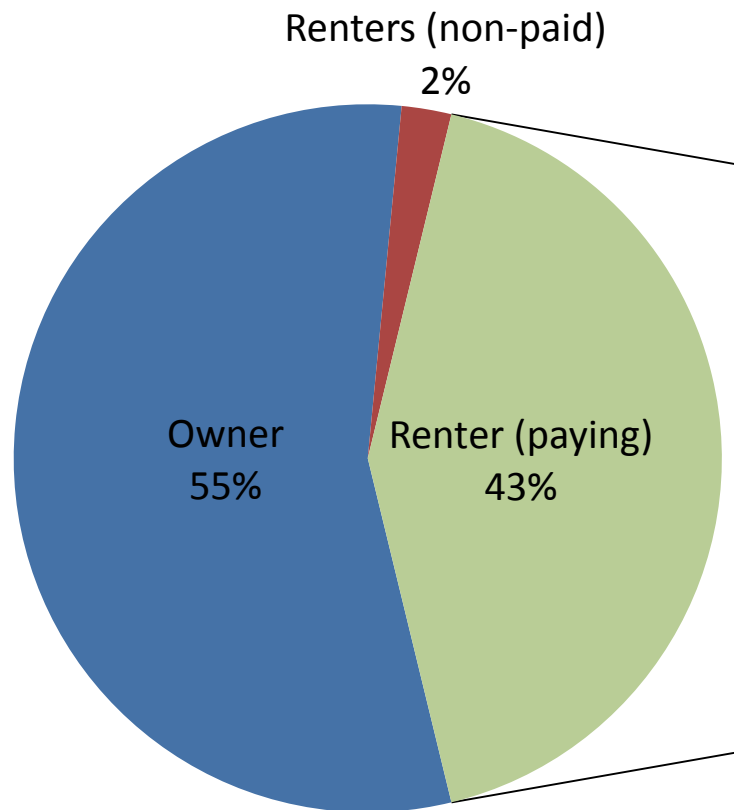
Comparison of Procurement Type by Income (\$000), 2012 to 2015



**How can we leverage information in the PEV ecosystem to geo-target infrastructure for the most immediate benefit?**



About half of the State's 12.5 M occupied housing units are rented.

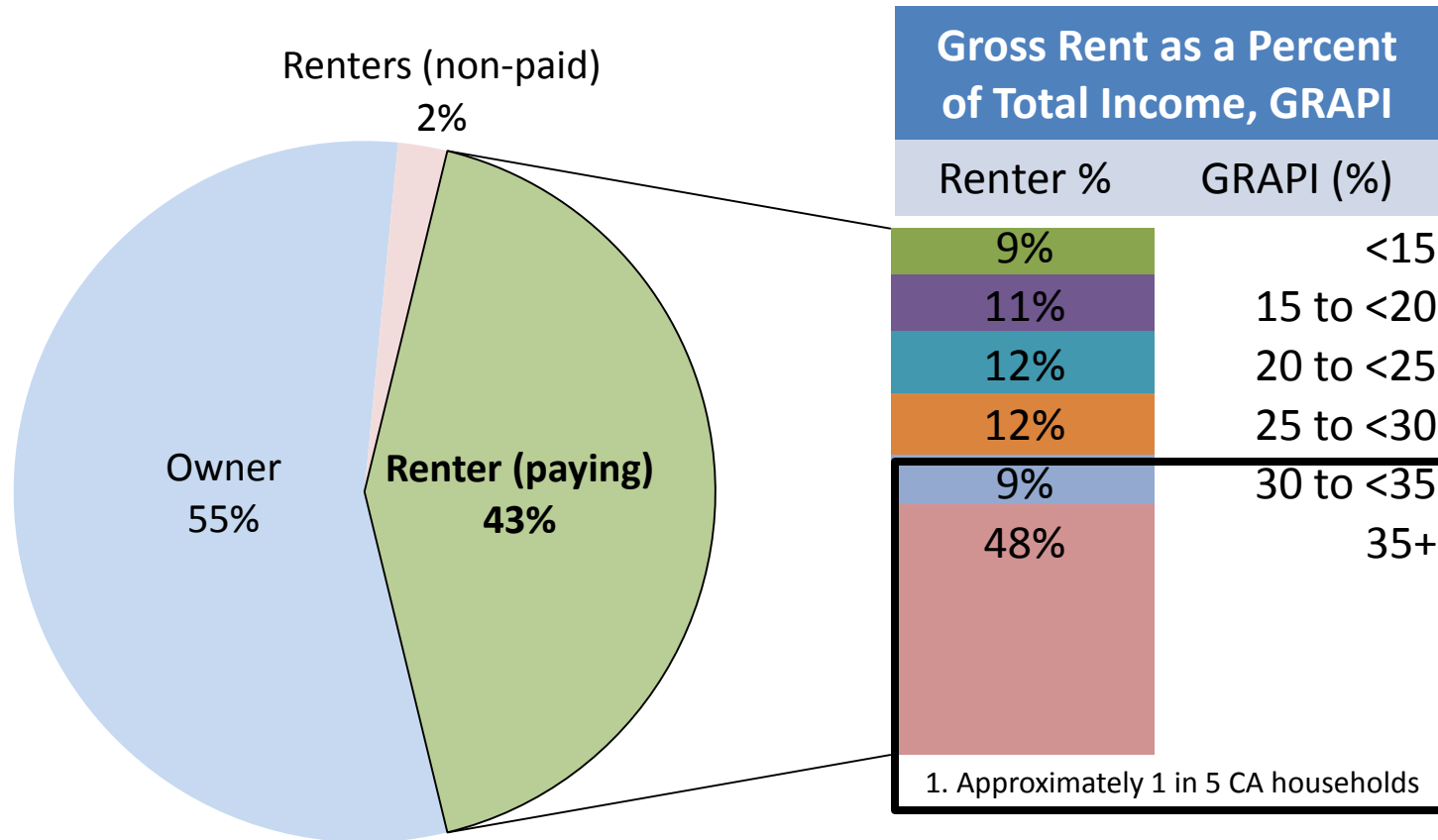


Occupant of Occupied Housing Units

While lessors of a dwelling must approve their lessee's request to install EVSE (AB 2565), other adoption barriers may exist.



Half of renters<sup>1</sup> pay one-third or more of their income on rent.



Occupant of Occupied Housing Units

**Is it appropriate to increment incentives based on economic need?**



# Discussion

- Does the Site Segmentation make sense?
- What additional Selection Criteria can be helpful for ensuring progress toward our PEV goals?
- How can we make more data-driven and robust planning decisions?



Stakeholder Activity

# **INTERACTIVE BRAINSTORM**



# Brainstorm Instructions (1)

## Group Discussion Topic

1. How can we manage turnover among occupants and employees?
2. How do we weigh the grid value of VGI-enabled EVSE versus higher initial cost?
3. How do we serve MUD residents without private parking?
4. What quantity of EVSE should be installed given uncertain future demand at a given site?
5. How should facility size (e.g. duplex vs. high-rise) impact site selection?
6. How do we minimize free ridership and leverage private investment?

## Consider Topic Qs among Lenses

1. Coordinated Planning
2. Tradeoffs
3. Resilient Infrastructure
  - Minimize obsolescence
4. Market Actor Perspectives
  - The facility hosting the infrastructure
  - The PEV driver
  - Others

See Agenda for details.





# Brainstorm Instructions (2)

## Rules

- Each individual is assigned to a group. Count off 1 to 6.
- We encourage new ideas and we will not attribute them to individuals or their organizations.
- Roles:
  - Discussants
  - Note-taker
  - Presenter(s)
- Supplies:
  - Posters, Post-Its, Markers

## Timing

### Breakout Time (20 min)

- 3-5 min: Individually note ideas to answer your question by the 4 Lenses.
- 10-12 min: Discuss among group.

### Reconvene & Report (30 min)

- 5 min: Each Group's presenter(s) summarizes responses.

### Reactions/Discussion (10 min)



California Public Utilities Commission - Energy Division & Stakeholders

# **APPLICATION: INFRASTRUCTURE IN DISADVANTAGED COMMUNITIES**



# MUD, Income, & Geo-Targeted Initiatives

## Charge Ahead California Initiative (SB 1275)

- Establish programs that further **increase access to and direct benefits** for disadvantaged, low-income, and moderate income communities and consumers from electric transportation including... **Deployment of charging infrastructure in MUD** in disadvantaged communities to remove barriers to zero-emission and near-zero-emission vehicle adoption by those who do not live in detached homes.

## GHG Reduction Fund (SB 535)

- Disadvantaged Communities** are identified based on geographic, socioeconomic, public health, and environmental hazard criteria including
  - Areas disproportionately affected by environmental **pollution** and other **hazards** that can lead to negative public **health effects, exposure, or environmental degradation**.
  - Areas with concentrations of people that are of **low income**, high **unemployment**, low levels of **homeownership**, high **rent burden**, **sensitive populations**, or low levels of **educational** attainment.

### Making the Cleanest Cars Affordable

EFMP® Plus-Up is helping low-income families save money with fuel-efficient and ultra-clean cars

#### STEP 1

##### Where do you live?

The pilot program is available in the South Coast Air Quality Management District & San Joaquin Valley Air Pollution Control District.

#### STEP 2

##### Scrap your old vehicle.

Turn in your dirty old vehicle. (Check with your Air District for eligibility requirements.)

#### STEP 3

##### What type of vehicle are you interested in?

Eligible vehicles must be less than 8 years old.	Hybrid 20 MPG +	Hybrid 35 MPG +	Plug-in Hybrid	EV
<b>Low Income</b> ≤ 225% of the federal poverty level	\$6,500	\$7,000	\$9,500 + \$1,500**	\$9,500 + \$2,500**
<b>Moderate Income</b> 226% - 300% of federal poverty level		\$5,000	\$7,500 + \$1,500**	\$7,500 + \$2,500**
<b>Above Moderate Income</b> 301% - 400% of federal poverty level			\$5,500 + \$1,500**	\$5,500 + \$2,500**

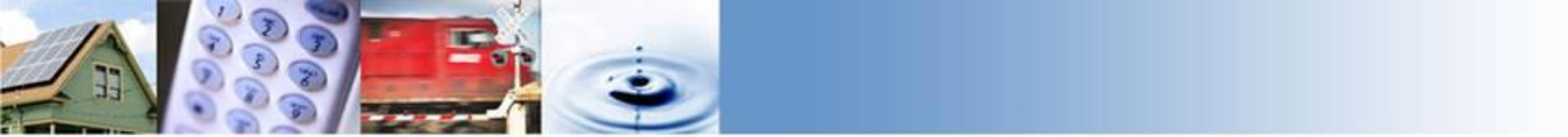
\* Enhanced Fleet Modernization Program  
\*\* Clean Vehicle Rebate Project for new vehicle purchases



# Discussion Questions

In Disadvantaged Communities...

- How do we evaluate potential future demand for charging infrastructure?
- How do we evaluate the effectiveness of infrastructure investments?
- What types of infrastructure and business models are most appropriate given use and facility characteristics?



# Wrap Up

- Site Selection Workshop (6/10)
  - Questions & comments from any part of the workshop.
  - Are there resources or data related to Site Segmentation & Selection Criteria that you want Energy Division to know about?
  - How would parties like to capture thoughts with the information presented and gathered today?
- Metrics Workshop on (6/16)
  - What specific issues or activities would you like Energy Division to focus more attention during the Metrics workshop?
  - Please prepare by coming with ideas on how to measure proposed Selection Criteria or propose additional criteria.
  - ED will set and notice an agenda based on informal feedback received to the above questions. **Please send to Adam & Noel by COB 6/11.**



# Thank you for participating!

**CPUC Alternative Fuel Vehicles Page**

**<http://www.cpuc.ca.gov/PUC/energy/altvehicles/>**

**Adam Langton**

**[Adam.langton@cpuc.ca.gov](mailto:Adam.langton@cpuc.ca.gov)**

**415-703-1812**

**Noel Crisostomo**

**[Noel.crisostomo@cpuc.ca.gov](mailto:Noel.crisostomo@cpuc.ca.gov)**

**415-703-5404**



# APPENDIX



# Regulatory & Policy Imperatives



Senate Bill 626 (2009) & P.U. Code 740.2



Executive Orders B-16-2012 & B-30-15



Climate Change Scoping Plan Update





# Existing Laws and Regulations Governing EV Infrastructure

Enacted	Requirement
<b>1990: PU Code 740.3</b>	Evaluate and implement policies to promote the development and infrastructure needed to facilitate the use of electric power...to fuel low-emission vehicles.
<b>2006: PU Code 740.8</b>	Defines ratepayer interests in PU Code 740.3 to include safety, reliability, and cost savings; activities that promote EE, environmental and health benefits from reduced air pollution and GHG, and increased alternative fuel use
<b>2009: PU Code 740.2</b>	Overcome barriers to the widespread deployment and use of PHEV and EV.
<b>2010: D.10-07-044</b>	Providers of electric vehicle charging services are not subject to regulation as a public utility
<b>2011: D.11-07-029</b>	<ul style="list-style-type: none"> <li>• The benefits of utility ownership of EVSE do not outweigh the competitive limitation that may result from it.</li> <li>• Until 2013, treat PEV upgrade costs in excess of the residential allowance as Common Facility Costs</li> </ul>
<b>2012: EO B-16-2012</b>	<ul style="list-style-type: none"> <li>• 2015: Metropolitan areas will accommodate ZEVs, each with infrastructure plans and streamlined permitting;</li> <li>• 2020: Infrastructure will be able to support up to 1 M ZEVs;</li> <li>• 2025: Californians will have easy access to ZEV infrastructure;</li> </ul>
<b>2013: D.13-06-014</b>	<ul style="list-style-type: none"> <li>• Until 2016, due to de minimis costs, continue the Common Facility Cost Treatment of D.11-07-029</li> </ul>
<b>SB 454</b>	• Electric Vehicle Charging Stations Open Access Act
<b>AB 1092</b>	• Building Standards Commission to mandate the installation of future EV infrastructure for parking spaces in MDU & Non-Res Development
<b>2014: AB 2565</b>	• Lessors of a dwelling must approve a Lessee's request to install an EVSE
<b>SB 1275</b>	• Deploy charging infrastructure in MDU in disadvantaged communities to remove barriers to ZEV adoption
<b>D.14-12-079</b>	• Reaffirm balancing test of D.11-07-029 but review utility proposals for EVSE ownership on a case-by-case basis.



Many Battery Electric Vehicles (BEVs) are available today and will soon be released featuring longer ranges, lower costs, and new model types.



Model Year 20-	Tesla Roadster	Ford Transit Cnnect	Nissan Leaf	Coda	Honda Fit	Mitsubishi i-MiEV	Tesla Model S	Toyota RAV 4	Fiat 500e	Ford Focus EV	Scion iQ EV	Smart ForTwo	BMW i3	Chevrolet Spark	Kia Soul	Mercedes B-Class	Volkswagen e-Golf	Chevrolet Bolt	Tesla Model X	BYD e6
09																				
10																				
11																				
12																				
13																				
14																				
15																				
TBR																				



<http://www.afdc.energy.gov/vehicles/search/light/> and select automakers



Many Plug-In Hybrid Electric Vehicles (PHEVs) are available today and will soon be released featuring longer ranges, lower costs, and new model types.



Model Year 20-	Chevrolet Volt	Fisker Karma	Toyota Prius PHEV	Ford Fusion Energi	Ford C-MAX Energi	BMW i3 --Range Ex	BMW i8	Cadillac ELR	Honda Accord PHEV	McLaren P1	Porsche Panamera	Audi e-Tron	Mercedes Benz S550 PHEV	Porsche Cayenne	Porsche 918	BMW X5 xDrive	Volvo XC90	Mitsubishi Outlander
09																		
10																		
11																		
12																		
13																		
14																		
15																		
TBR																		

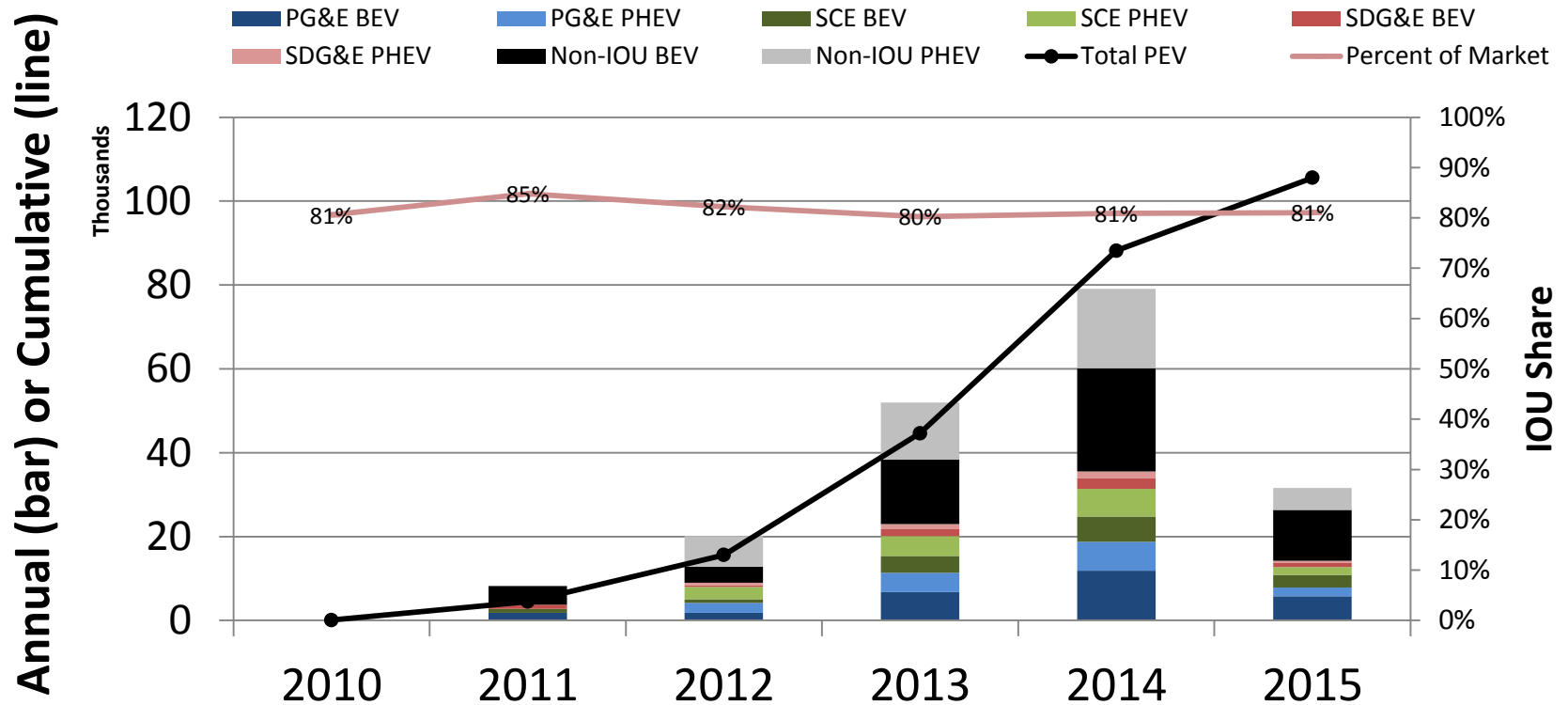


<http://www.afdc.energy.gov/vehicles/search/light/> and select automakers



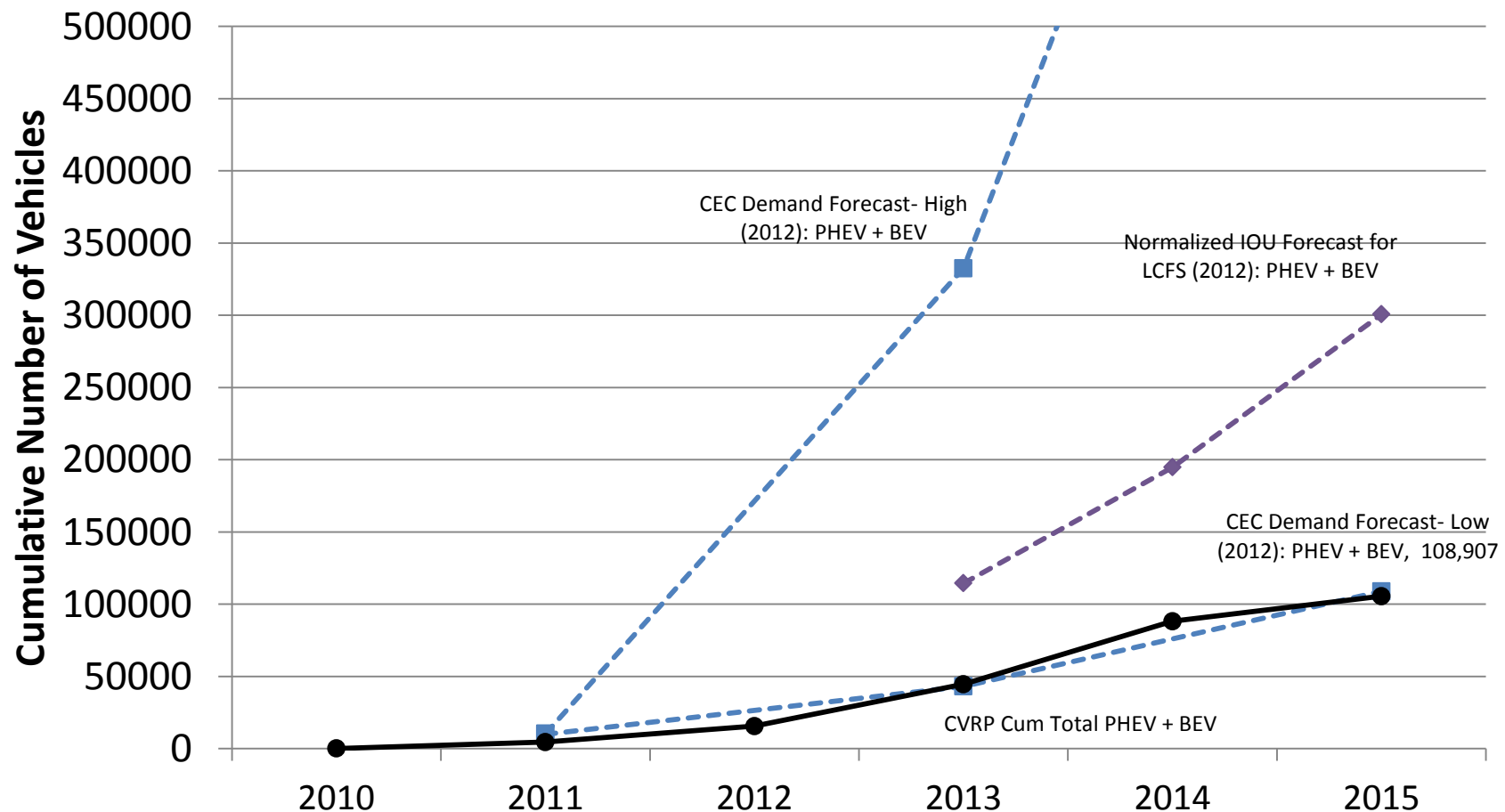
# Commensurately, PEV use continues to grow...

**Plug-In Electric Vehicle recipients of the Clean Vehicle Rebate Program as of May 25, 2015**





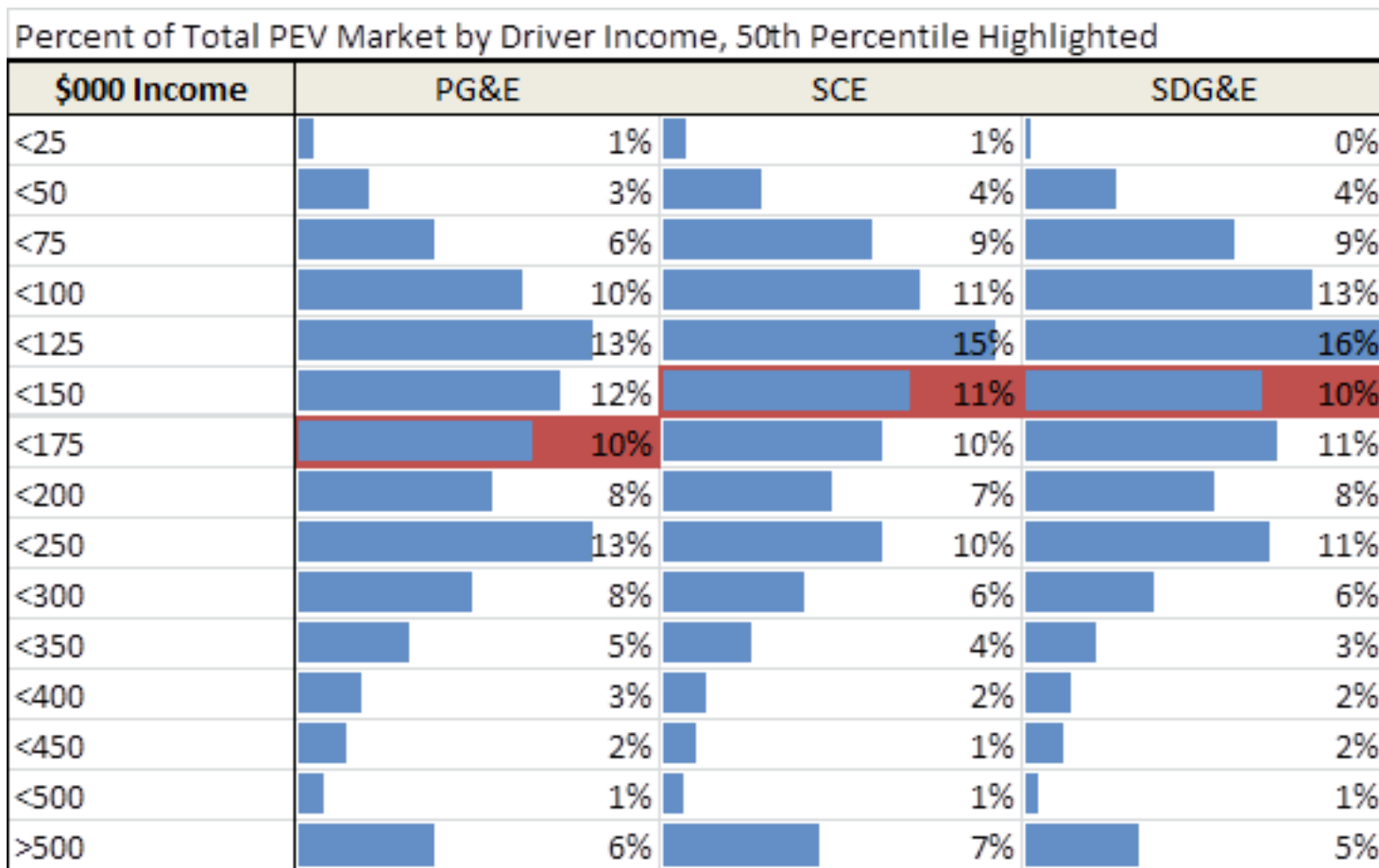
...However, adoption tracks CEC's "Low" Forecast.







The “median” adopter varies in income across IOU territories.



# Income Distribution by Region, Make, and Acquisition Type



PG&E	Chevrolet				Ford				Nissan				Tesla				Toyota				Other					
	BEV		PHEV		BEV		PHEV		BEV		PHEV		BEV		PHEV		BEV		PHEV		BEV		PHEV			
\$000 Income	L	P	L	P	L	P	L	P	L	P	L	P	L	P	L	P	L	P	L	P	L	P	L	P	Income % Total	Cum.
<25		1	2	5			1	1	10	2			4		1		4		9						0.6%	0.6%
<50	7	1	18	13	8	3	10	11	43	5			9	2	1	5	24	35	7			1		3.1%	3.7%	
<75	7	4	30	39	7	5	11	27	87	18			19	2	3	15	40	63	10		1			5.9%	9.6%	
<100	15	11	57	79	14	2	26	41	153	43			27	8	6	7	60	81	14			1		9.8%	19.5%	
<125	17	15	66	103	19	4	42	64	181	49			60	15	5	12	78	93	15	2	3			12.9%	32.4%	
<150	11	5	55	71	16	5	36	46	199	32			68	12	5	17	60	92	17	2	5			11.5%	43.9%	
<175	9	11	41	76	14	11	25	59	150	38	1		71	10	7	12	47	75	6	3	7			10.3%	54.1%	
<200	9	6	33	70	11	6	21	37	132	24			64	17	9	7	35	62	10			3		8.5%	62.6%	
<250	8	5	72	85	18	13	39	55	183	38	5	128	18	12	9	51	83	19			6			12.9%	75.6%	
<300	8	3	43	47	16	2	21	27	85	16		115	16	8	3	33	45	10	2	1				7.7%	83.2%	
<350	5	2	30	30	4	2	12	18	60	12	3	68	8		2	16	36	9			2			4.9%	88.1%	
<400	2	3	11	12			7	8	28	7		53	4	1	6	9	16	8	1	2				2.7%	90.8%	
<450		1	7	12	5			10	22	3		58	1			7	6	3			1			2.1%	92.9%	
<500	1		10	4	1		1	4	8	1	1	29		1	2	2	8				2			1.1%	94.0%	
>500		2	15	16	2	4	3	9	19	7	1	252	3	7	3	11	27	5	3	2				6.0%	100.0%	
Model % Total	2%	1%	7%	10%	2%	1%	4%	6%	21%	5%	0%	16%	2%	1%	2%	7%	11%	2%	0%	1%						

SCE	Chevrolet				Ford				Nissan				Tesla				Toyota				Other							
	BEV		PHEV		BEV		PHEV		BEV		PHEV		PHEV		BEV		PHEV		BEV		PHEV		BEV		PHEV			
\$000 Income	L	P	L	P	L	P	L	P	L	P	L	P	L	P	L	P	L	P	L	P	L	P	L	P	L	P	Income % Total	Cum.
<25	3		10	1	2		3	1	11	1					1		3	7	6	1							1.0%	1.0%
<50	7	2	28	20	1	1	10	8	55	5			4	3			20	24	36	1	1						4.4%	5.4%
<75	21	6	74	42	8	1	41	27	65	11	1		12	5	1		33	44	69	11	1	1					9.3%	14.7%
<100	6	1	78	75	10	1	33	29	94	23			22	9	2		34	57	87	14	3	4					11.4%	26.1%
<125	17	4	118	103	10	1	44	36	90	17	2		53	14	6		38	90	89	12	3	1					14.7%	40.8%
<150	8	3	83	75	10	2	32	29	84	17	1		41	14	4		17	46	79	7							10.9%	51.7%
<175	9	1	75	53	10	3	19	29	69	10			43	12	2		20	56	67	12	1	3					9.7%	61.4%
<200	9		59	43	6	6	20	24	46	8			41	9	2		14	27	57	5	1	3					7.5%	68.9%
<250	2	3	84	60	6	2	25	30	55	7	1		71	14	3		14	43	61	10	2						9.7%	78.5%
<300	1		49	31	6	2	10	15	27	7			77	10	2		5	25	40	7	3	2					6.3%	84.8%
<350	3	3	31	22	1		7	9	8	1	2		59	5	2		7	15	22	3	2						4.0%	88.7%
<400			10	14	2		7	4	9	1	2		25	4			4	8	8	3		1					2.0%	90.7%
<450			8	8			2	4	3	1	2		32				1	2	11	1							1.5%	92.2%
<500			6	2					1		1		26					8									0.9%	93.1%
>500			27	12	2		8	4	11	3	15		213	7	1		3	13	19	7	4	4					6.9%	100.0%
Model % Total	2%	0%	15%	11%	1%	0%	5%	5%	12%	2%	1%	14%	2%	0%	4%	9%	13%	2%	0%	0%								

SDG&E	Chevrolet				Ford				Nissan				Tesla				Toyota				Other					
	BEV		PHEV		BEV		PHEV		BEV		PHEV		BEV		PHEV		BEV		PHEV							
\$000 Income	L	P	L	P	L	P	L	P	L	P	L	P	L	P	L	P	L	P	L	P	Income % Total	Cum.				
<25													1				1					0.2%	0.2%			
<50	1	1	2	2	3		3	2	11	1		1	1		2	6	8	2		1		4.0%	4.1%			
<75	3	1	10	15	1	1	6	6	22	4		2	2		1	5	26	3				9.1%	13.3%			
<100	5		8	17	5	1	13	11	35	4		11	1	1	2	7	23	4				12.5%	25.8%			
<125	3	2	13	28	9		14	10	37	10		10	4		3	19	21			2		15.7%	41.5%			
<150	3	1	11	11	7	2	6	10	21	7		12	2		1	7	18	2		2		10.4%	51.9%			
<175		1	12	15	7		7	5	22	10		12	4	1	3	4	21	4		2		11.0%	62.9%			
<200	1	1	5	17	6	2	2	7	22	6		8	2	2		3	11	2		1		8.3%	71.2%			
<250	2		7	10	4	4	8	10	18	8	1	16	5	3		7	18	3	1	2		10.8%	82.0%			
<300	1		6	4	1		5	6	4	1		21	1	2		4	5	5		1		5.7%	87.6%			
<350			3	1			2	4	6	2	1	10	2			1	2	3				3.1%	90.8%			
<400			2	1	1		1	1	6	2		7					2	1				2.0%	92.8%			
<450			1	1	2				1			10			1		3	1				1.7%	94.5%			
<500					1							3				1	1					0.5%	95.0%			
>500			5	3			1	1	1			43				3	1	2				5.0%	100.0%			
Model % Total	2%	1%	7%	11%	4%	1%	6%	6%	17%	5%	0%	14%	2%	1%	1%	6%	14%	3%	0%	1%						





# PEV Infrastructure garners little attention among parking professionals.

- Surveys of parking and transportation professionals by the International Parking Institute (IPI) indicate that their members consider PEVs as a lower-level issue. Particularly compared to:
  - Securing payment and ensuring revenue through the use of new technology.
  - Decreasing monitoring and maintenance costs.
  - Addressing societal trends that may jeopardize continued profitability.





## Parking managers will invest first in solutions that ensure revenue improve facility management

2011	2012	2013	Impactful Trends	
24	57	59	Technology to improve access control & automate payment	<b>Payment</b>
32	64	54	Cashless & electronic payment	
27	49	52	Mobile phones to find, reserve, & pay for parking	
	49	43	Collaboration btw. Parking, transportation, & planning decisionmakers	
44	49	38	Increasing revenue	
23	37	31	Improve customer service	
36	36	30	Green and sustainable solutions	
		28	Parking information systems/dashboards	<b>Monitoring</b>
14	29	25	Wireless sensors for traffic management	
23	25	24	Public/Private Partnerships	
19	20	20	Accommodate PEVs & charging stations	
	21	17	Aesthetics	
12		14	Security	
		14	Human resources	
		11	Alternate facility uses during off-peak hours	
		10	Robotic/automated parking	



High priority sustainability measures also improve space utilization and decrease major energy end-use costs.

2012	2013	Greatest Potential for Sustainability
51	57	Guidance systems to park faster
57	55	Efficient Lighting
43	42	Alternative Travel
40	33	Automated Payment
17	21	Accommodate PEVs
23	20	Install Renewables
25	14	Photovoltaics
14	11	Water/Stormwater Management Systems
8	9	Permeable Pavements
11	7	Recycled Building Material
3	3	Waste Management Systems

**Higher Throughput &  
Lower Energy Costs**

**Distributed Generation**



# IPI considers AFVs to be the least important social driver of change to their business

2012	2013	Most Influential Societal Changes	
56	62	Traffic Congestion	<b>Negative Impacts on Revenue</b>
54	54	Gas prices	
46	44	Liveable, walkable communities	
50	43	Focus on environment & sustainability	
23	34	Aging population	
25	29	Bicycle commuters	
40	26	Urban migration	
17	22	Safety	
16	16	Aesthetics	
8	13	Alternative Fuel Vehicles	

# Most Influential Societal Changes on Parking - Ranking



	AUSTRALIA	BRAZIL	BRITAIN	CANADA	EPA	FINLAND	GERMANY	IRELAND	JAPAN	NORWAY	SPAIN	SWEDEN	USA
Increased Traffic Congestion	1	2	2	1	1	4*	2	4	-	3*	3*	-	1
Increased Fuel Prices	2	-	3	3	3	-	3	2	In top 5	-	1*	-	2
Increased use of mass transit	3*	-	-	5	4*	4*	-	5*	In top 5	3*	3*	5*	-
Economic pressures	3*	4	1	-	2	-	-	1	In top 5	3*	1*	-	Not asked in USA survey
Focus on sustainability	5	5	-	2	4*	1*	-	-	-	1*	-	1	4*
Desire for walkable communities	-	-	-	4	-	1*	4*	5*	In top 5	1*	-	2*	3
Aging population	-	-	-	-	-	1*	1	-	In top 5	-	-	-	5
Increased migration to urban areas	-	3	-	-	-	4*	-	-	-	3*	-	5*	-
Concerns about safety	-	1	-	-	-	-	4*	-	-	-	-	-	-
Increased use of bicycles	-	-	5	-	-	-	-	3	-	-	-	-	-
Aggressive lobbying from motorists	-	-	4	-	-	-	-	-	-	-	3*	-	-
Increased work flexibility	-	-	-	-	-	-	-	5*	-	-	3*	-	-
Increased number of alternative fuel vehicles	-	-	-	-	-	-	-	-	-	-	-	2*	-
Desire for more aesthetic design	-	-	-	-	-	-	-	-	-	-	-	2*	-

\*Indicates a tie